Smiling at Two Digit Multiplication!!!

Brief Overview:

Students will solve multiplication problems by utilizing the multiplication strategies for Traditional Multiplication (repeated addition and multiplication fact sheet), the Partial Products Methods using factors as sums of ones, tens, and hundreds and the Lattice Method finding the product using the lattice grid.

NCTM Content Standard/National Science Education Standard:

- Numbers and Operations: Students will develop a quick recall of multiplication facts and fluency with whole number multiplication.
- Develop fluency with efficient procedures, including standard algorithm for multiplying whole numbers, understand why the procedure works on the basis of place value and properties of operations), and use them to solve problems.

Grade/Level:

Grade 4

Duration/Length:

Three Lessons – 60 minutes per lesson.

Student Outcomes:

Students will:

- Apply knowledge of whole numbers and place value.
- Read, write, and represent whole numbers using symbols, words, and models.
- Identify the place value of a digit in a number.
- Analyze number relations and multiply whole numbers.
- Learn three ways to solve a two-digit multiplication problem.

Materials and Resources:

Lesson 1

- Overhead Projector
- Multiplication Fact Sheet
- Place Value Blocks (100's, 10's and 1's.)
- Plain and Grid Paper
- Multiplication flash cards

Lesson 2

- Overhead Projector

- Partial Product Multiplication Transparency for Teacher Resource 2
- Partial Product Worksheet
- Plain paper

Lesson 3

- Plain paper
- Lattice Method Grid Worksheet
- Lattice Transparency
- Colored Pencils (Red and Blue)

Development/Procedures:

Lesson 1

Pre-assessment

- Distribute a Multiplication Fact sheet as a reference for students to use to find the product for the Traditional Method multiplication problems. (Student Resource 1)
- "Smiley Partners" will be your partner at your table .

Launch

- Show individuals a multiplication flash card to answer problems from flash cards and give the product.
- Math competition - Boys vs. Girls
- Informally assess each student's mastery of basic facts.
- Do 2-3 facts per student using flash cards..

Teacher Facilitation

- Introduce and model the concept of determining the product of 2 two-digit numbers.
- Demonstrate how to find the product of a two-digit number referencing the Multiplication Fact Sheet. (Resource 1)
- Demonstrate the use of place value blocks to find the product of a 2 digit by a 2 digit number.
- Demonstrate the regrouping of two-digit multipliers.

Student Application

- Use Multiplication Fact Sheet (Resource 1) to solve a problem, place value blocks to find the product.
- Regroup a two-digit multiplier to find the product.
- Show the steps to find the product.

- In whole group with teacher facilitation, find the product of two sample two-digit multipliers: (1) 22 x 11 = __242__ and (2) 17 x 33 =__561__.
- Students will review the process of regrouping to find the product.
- Demonstrate the regrouping of two-digit multipliers.

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Embedded Assessment

- Circulate during student application to informally assess student's mastery of the skill.

Reteaching/Extension

Extension Activity

- Students that have shown mastery of the skill will work individually to work two-digit by two-digit practice problems.

Reteaching Activity

- Students that have shown difficulty with mastery of the lesson skills will meet with the teacher in a small group to participate in reinforcement of regrouping related to finding the product.

Lesson 2

Pre-assessment

- Distribute a Warm-up Sheet to each student to assess the skill of multiplying a two-digit number by a two-digit number Student Resource 2).

Launch

- Students will partner with a "Smiley Partner " to find the product of a two-digit multiplication problem. (1) 67 x 53 = ___3,551____
- Students will compare answers with their "Smiley Partner".

Teacher Facilitation

- Introduce the partial product method to find the product of two 2-digit numbers (Student Resource 3).
- Explain that in partial products multiplication, each factor is thought of as a sum of ones, tens, hundreds, and so on.
- Each part of one factor is then multiplied by each part of the other factor, and finally, all of the resulting partial products are added together (Teacher Resource 1, Student Resource 3).

Student Application

- Have students discuss the Partial Products Method with a "Smiley Partner".
- Have students solve a two-digit by two-digit multiplication problem using the partial product method. with their "Smiley Partner") (1) 38 x 79 = __3,002__. (Student Resource 4) (Answer key: Teacher Resource 2)
- Students will write a Brief Constructed Response to solve the problem, 21 x 34 = 711 (Student Response 5) (Answer key: Teacher Response 3)

Embedded Assessment

- Circulate during student application to informally assess each student's mastery of the skill.

Reteaching/Extension

Extension Activity

- Students that have shown mastery of the skill will work individually to solve two-digit by two-digit problems using the partial products method to solve the problems.

Reteaching Activity

- Students that have shown difficulty with mastery of the lesson skills will meet with the teacher in a small group to participate in reinforcement of regrouping related to finding the product using the partial products method.

Lesson 3

Pre-assessment

- Review multiplication math facts by having students complete a five problem multiplication warm-up consisting of multiplying 1 digit and two-digit numbers. (Student Resource 6) (Answer key: Teacher Response 4)

- Solve a two-digit by two-digit multiplication problem by using the traditional and partial product method. (Student Resource 6) (Teacher Resource 4)

Launch

- Explain that the Lattice Method of multiplication was introduced in Europe in 1202 by Fibonacci, an Italian. Before this system was introduced, multiplication was very difficult and done by only a few people using counters. His system made multiplying much easier for everyone. Its name

was derived from its resemblance to the lattice structure that the ivy plant grows on.

Teacher Facilitation

- Teacher will review the traditional and partial product method of multiplication and then model several problems solved using the Lattice Grid Method. (Student Resource 7)
- Write the digits for the first factor across the top (one in each box).
- Write the digits for the second factor down the right side (one in each box).
- Multiply each digit across the top by the digits down the right side (partial products) and record the answers in the diagonal boxes.
- Add the numbers on the diagonals.
- The answer is read down the left side and across the bottom.

Student Application

- Students will work with a partner and complete a lattice grid sample chart. They will explain one of their problems to the class after a given practice time period has elapsed (10 minutes).
- Students will next complete a Lattice Multiplication quiz. (Student Resource 8)
- Students will complete Brief Constructed Response on Lattice Multiplication Method. (Student Resource 9) (Answer key: Teacher Resource 5)

Embedded Assessment

- Teacher will observe students as students work problems using this process. Collect sample practice problems to determine progress with the multiplication of whole numbers. Review the completed Lattice Multiplication quiz and assess understanding.

Reteaching/Extension

Extension

- Students who have understood the lesson will move on to the next step in development of the concept. (multiplying 3 digit by 3 or 4 digit whole numbers).

Reteaching

- Students who have not completely understood/or are struggling with the lesson will work in a small group setting to review the concept and reinforce understanding.

Summative Assessment:

- Students will demonstrate their understanding of alternative methods of two-digit by two-digit multiplication using the Traditional, Partial Product, and Lattice Methods by completing the assessment. (Student Resource 10) (Answer key: Teacher Resource 6)

Authors:

Bernette Richardson
Shabach! Christian Academy
Prince George's County, Maryland

Frederick D. Price
Magnolia Elementary School
Prince George's County, Maryland

Name _____ Date _____

Multiplication Partial Products Method

To find 67 x 53, think of
67 as 60 + 7 and 53 as
50 + 3. Then multiply
Each part of one sum by each
part of the other and add the results.

	67
	x 53
Calculate 50 x 60	3,000
Calculate 50 x 7	350
Calculate 3 x 60	180
Calculate 3 x 7	+ 21
Add the results	3,551

Name _____ Date _____

Multiplication Partial Products Method

TRY THIS ONE ON YOUR OWN.

$$\begin{array}{r} 38 \\ \times\ 79 \\ \hline \end{array}$$

Calculate 30 X 70 — 2,100

Calculate 70 X 8 — 560

Calculate 9 X 30 — 270

Calculate 9 X 8 — + 72

ADD THE RESULTS — 3,002

Name _____ Date _____

BRIEF CONSTRUCTED RESPONSE

Explain the process to find the product of 21 x 34 using the partial products method of multiplication. Find the product.

21
x 34

To find 21 x 34, think of 20 + 1 and 30 + 4. Then multiply each part and add the results.

	21 X 34
Calculate 30 x 20	600
Calculate 30 x 1	30
Calculate 4 x 20	80
Calculate 4x 1	+ 4
Add the results	714

The product is 714.

Name _____ Date _____

Lesson 3 Warm-Up

I. Find the products:

1. 8 x 3 = 24 **2. 9 x 6 = 54** **3. 7 x 4 = 28**

4. 11 x 7 = 77 **5. 12 x 9 = 108**

II. Find the product using the Partial Product Method.

86
X49

Calculate

09 x 06 = 54

09 x 80 = 720

40 x 06 = 240

40 x 80 = 3200

Add the Results 54 + 720 + 240 + 3200
Product is 4214

III. Find the product using the Traditional algorithm.

2 5
86
X49
774
3440
4214

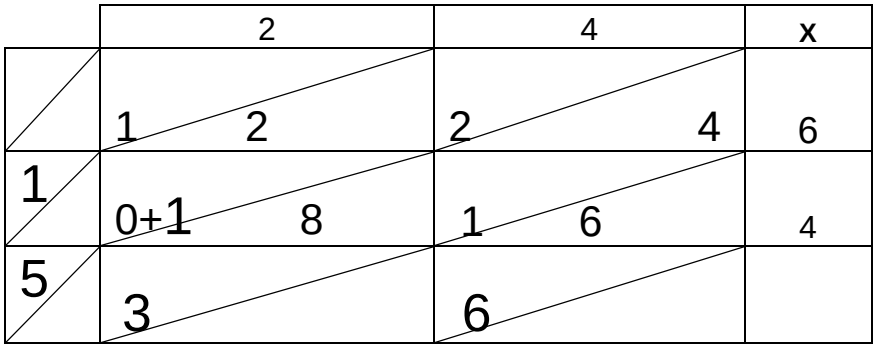
Brief Constructed Response

John invited 24 of his friends to his birthday party. He bought bags of marbles to give to each of his guests. Each bag contained 64 marbles.

Step A
Use the Lattice Multiplication method to determine the total number of marbles John's friends received.

1536 marbles

Step B
Use what you know about Lattice Multiplication Method to explain why your answer is correct. Use words and/or numbers in your explanation.



- Write the digit for the first factor across the top (one each box)
- Write the digits for the second factor down the right side (one each box).
- Multiply each digit across the top by the digits down the right side (partial products).
- Add the numbers on the diagonals.
- My answer 1536 is read starting down the left side and across the bottom.

Name _____ Date _____

ASSESSMENT

Directions: Find the products to the following problems by either the Traditional Method, Partial Products Method, or the Lattice Method of multiplication.

1. 36 x 52 = ___1,872___

2.
$$\begin{array}{r} 28 \\ \underline{\times\ 46} \\ 1{,}288 \end{array}$$

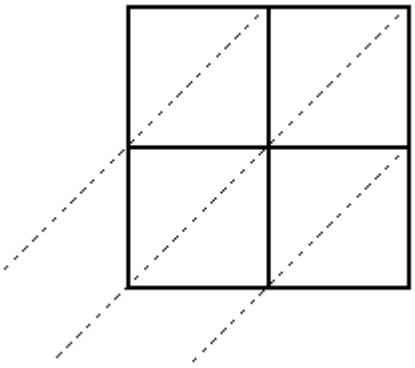
3.
$$\begin{array}{r} 23 \\ \underline{\times\ 38} \end{array}$$

Calculate 30 x 20	600
Calculate 30 x 3	90
Calculate 8 x 20	160
Calculate 8 x 3 +	24
Then Add	874

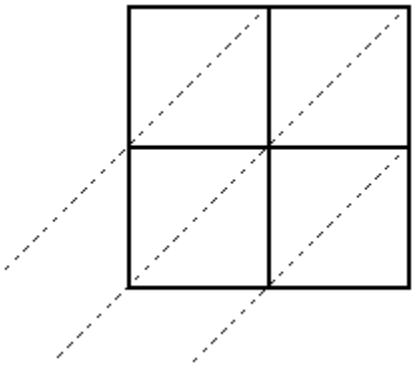
4.
$$\begin{array}{r} 34 \\ \underline{\times\ 15} \end{array}$$

Calculate 10 x 30	300
Calculate 10 x 4	40
Calculate 5 x 30	150
Calculate 5 x 4 +	20
Then Add	510

5. 23 x 38 = _874_



6. 34 x 15 = _510_



Multiplication Facts Chart

x	0	1	2	3	4	5	6	7	8	9	10
0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9	10
2	0	2	4	6	8	10	12	14	16	18	20
3	0	3	6	9	12	15	18	21	24	27	30
4	0	4	8	12	16	20	24	28	32	36	40
5	0	5	10	15	20	25	30	35	40	45	50
6	0	6	12	18	24	30	36	42	48	54	60
7	0	7	14	21	28	35	42	49	56	63	70
8	0	8	16	24	32	40	48	56	64	72	80
9	0	9	18	27	36	45	54	63	72	81	90
10	0	10	20	30	40	50	60	70	80	90	100

Name _____ Date _____

Lesson 2 Warm-Up

IV. Find the products:

1. 2 8 x 33 = _____ **2. 19 x 36 = _____** **3. 72 x 41 = _____**

4. 11 x 70 = _____ **5. 12 x 92 = _____**

Name _____ Date _____

Multiplication Partial Products Method

To find 67 x 53, think of
67 as 60 + 7 and 53 as
50 + 3. Then multiply
Each part of one sum by each
part of the other and add the results.

	67
	x 53
Calculate 50 x 60	3,000
Calculate 50 x 7	350
Calculate 3 x 60	180
Calculate 3 x 7	+ 21
Add the results	

Name _____ Date _____

Multiplication Partial Products Method

TRY THIS ONE ON
YOUR OWN.

38
x 79

Calculate ____ x _____ _____

Calculate ____ x _____ _____

Calculate ____ x _____ _____

Calculate ____ x _____ + _____

ADD THE RESULTS _____

Name _____ Date _____

BRIEF CONSTRUCTED RESPONSE

Explain the process to find the product of 21 x 34 using the partial products method of multiplication. Find the product.

21
x 34

_____

_____

_____

_____

_____

_____

_____

_____

Name _____ Date _____

Lesson 3 Warm-Up

V. Find the products:

1. 8 x 3 = _____ 2. 9 x 6 = _____ 3. 7 x 4 = _____

4. 11 x 7 = _____ 5. 12 x 9 = _____

VI. Find the product using the Partial Product Method.

86
X49

V11. Find the product using the traditional algorithm method.

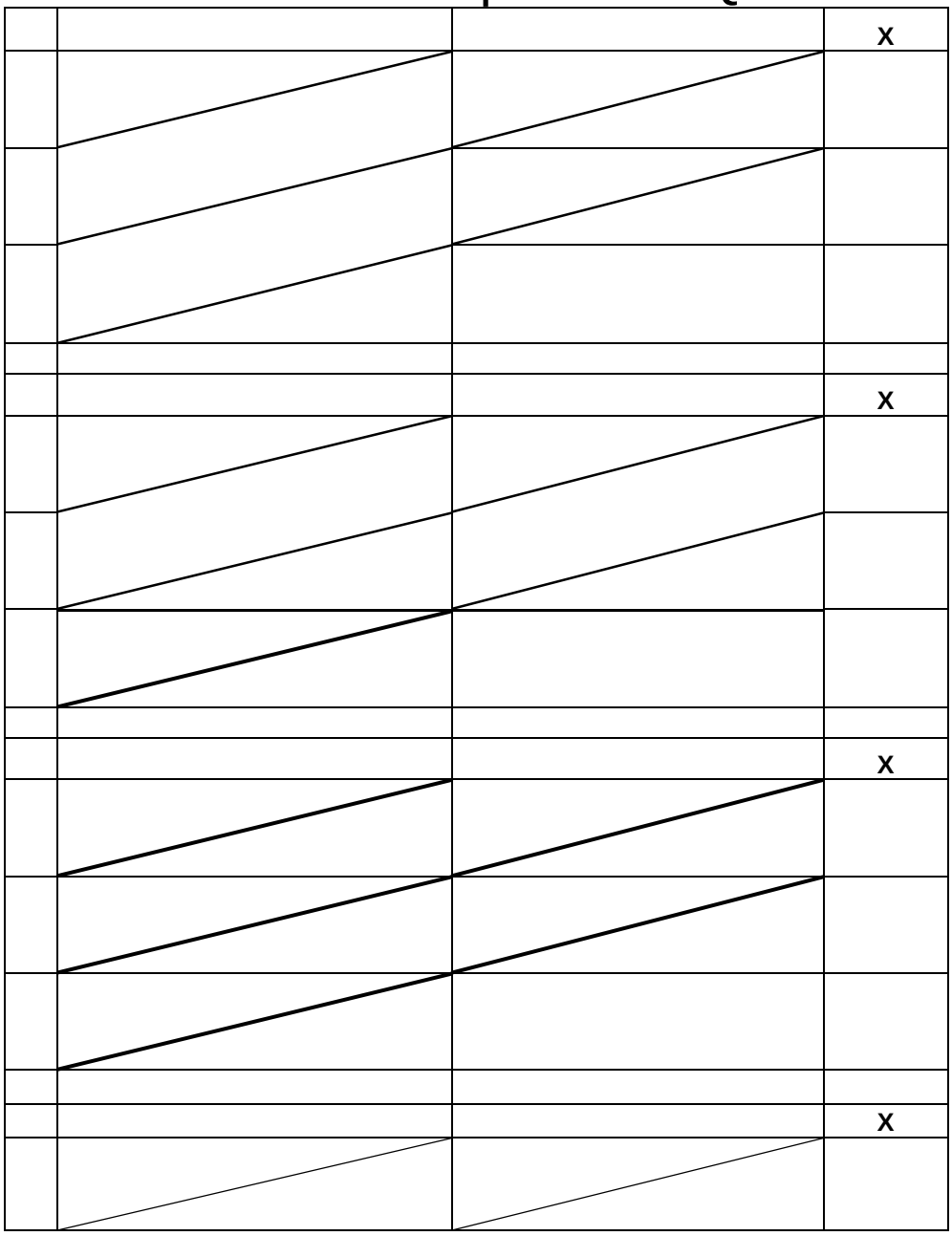
86
X49

Lattice Grid Chart

Name _____ Date _____

Lattice Multiplication Quiz

1) 24x68



2) 35 x 72

3) 83x58

Brief Constructed Response

John invited 24 of his friends to his birthday party. He bought bags of marbles to give to each of his guests. Each bag contained 64 marbles.

Step A

Use the Lattice Multiplication method to determine the total number of marbles John's friends received.

_____

Step B

Use what you know about Lattice Multiplication Method to explain why your answer is correct. Use words and/or numbers in your explanation.

_____

_____

_____

_____

_____

Mathematics BCR Rubric

Part A.

1 The response is correct.

0. The response is incorrect.

Part B.

2 The response demonstrates a complete understanding and analysis of a problem.

- Application of a reasonable strategy in the context of the problem is indicated.
- Explanation[1] of and/or justification[2] for the mathematical process(es) used to solve a problem is clear, developed, and logical.
- Connections and/or extensions made within mathematics or outside of mathematics are clear.
- Supportive information and/or numbers are provided as appropriate. [3]

1 The response demonstrates a minimal understanding and analysis of a problem.

- Partial application of a strategy in the context of the problem is indicated.
- Explanation[1] of and/or justification[2] for the mathematical process(es) used to solve a problem is partially developed, logically flawed, or missing.
- Connections and/or extensions made within mathematics or outside of mathematics are partial or overly general, or flawed.
- Supportive information and/or numbers may or may not be provided as appropriate. [3]

0 The response is completely incorrect, irrelevant to the problem, or missing. [4]

Notes:

[1] **Explanation** refers to students' ability to communicate **how** they arrived at the solution for an item using the language of mathematics.

[2] **Justification** refers to students' ability to support the reasoning used to solve a problem, or to demonstrate **why** the solution is correct using mathematical concepts and principles.

[3] Students need to complete rubric criteria for ***explanation, justification, connections*** and/or ***extensions*** as cued for in a given problem.

[4] Merely an exact copy or paraphrase of the problem will receive a score of "0".

Name _____ Date _____

ASSESSMENT

Directions: Find the products to the following problems by either the Traditional Method, Partial Products Method, or the Lattice Method of multiplication.

2. 36 x 52 = _____

2.
$$\begin{array}{r} 28 \\ \times\ 46 \\ \hline \end{array}$$

3.
$$\begin{array}{r} 23 \\ \times\ 38 \\ \hline \end{array}$$

Calculate __x ___

Calculate __x ___

Calculate __x ___

Calculate __x ___+_____

Then Add

4.
$$\begin{array}{r} 34 \\ \times\ 15 \\ \hline \end{array}$$

Calculate __x ___

Calculate __x ___

Calculate __x ___

Calculate __x ___ + _____

Then Add

5. 23 x 38 = _____

6. 34 x 15 = _____